

# RESEARCH BRIEF

## ACHIEVING COLLEGE SUCCESS:

The impact of the College Success/STEM program on students' matriculation to and persistence in college



Commissioned by Mass Insight  
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INSTLL, LLC



Institute for Strategic Leadership and Learning  
Advancing Innovation and Transformational Change

### Mass Insight Education's College Success/STEM program

is a research-based replication program, currently in 63 schools across Massachusetts, designed to dramatically increase students' participation and performance in Advanced Placement® (AP)\* math, science, and English courses, leading to increased college attendance and persistence rates. To document and evaluate the impact of the College Success/STEM program, Mass Insight has partnered with the Institute for Strategic Leadership and Learning (INSTLL) on a multi-year research agenda. (See Appendix A for an overview of program components.)

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# Mass Insight

## EDUCATION

Mass Insight Education, a 501(c)(3) non-profit organization based in Boston, Mass. was founded in 1997. Its launch reflected the high priority that business, government, and education leaders placed at that time on the success of Massachusetts' nascent standards-based reform drive, set in motion by the passage of the Education Reform Act of 1993. It is the sister organization of Mass Insight Global Partnerships, which has worked since 1989 to keep Massachusetts and its businesses and institutions globally competitive. Mass Insight Education focuses on strategies to transform public schools into high-performance organizations and to close the achievement gaps.

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**IN THIS RESEARCH BRIEF,** we provide updated evaluation findings documenting the extent to which Mass Insight students—those students taking at least one Advanced Placement® math, science, or English course in high school—are attending and persisting in college. Building upon the 2013 *Achieving College Success* report, this report provides comprehensive data on Mass Insight students who graduated from high school in 2009, 2010, or 2011, representing 4,997 students across 45 schools. Evaluation questions addressed in this report include:

- **What is the impact of the College Success/STEM program on students' matriculation to and persistence in college?**

We provide a detailed analysis of college matriculation and persistence rates among Mass Insight students, including low-income and minority students, compared to state averages and in reference to program-defined benchmarks for college success. We also explore the impact that the College Success/STEM program is having on low-income students identified as “not likely to attend college” but who were recruited into the program and took one or more AP courses while in high school.

- **What is the relationship between students' success on AP exams (e.g., scoring a 3, 4, or 5), their decision to attend a two- or four-year college, and subsequent college matriculation and persistence?** Building upon a key finding from the 2013 College Success report, we investigate whether scoring a 1 or 2 on an AP exam continues to have a positive impact on college matriculation and success in two- and four-year colleges.

**This College Success Research Brief** is one of a series of briefs documenting the implementation and impact of Mass Insight's College Success/STEM program. Our research briefs are intended to share key findings, highlight ongoing questions and lines of inquiry, and inform the thinking of practitioners and policymakers on how to scale up efforts to accelerate improvements in districts and schools, focusing on college readiness and success.

## IMPORTANT TERMS

**College Success/STEM program:** A research-based academic program that uses the Advanced Placement® (AP) platform, combined with significant training for teachers, support for students, and rewards for teachers and students, to dramatically increase student enrollment and success in AP math, science, and English courses.

**Mass Insight schools:** Schools that have partnered with Mass Insight Education to implement the College Success/STEM program.

**Mass Insight students:** Students from a Mass Insight partner school who take one or more AP courses in math, science, and English and who graduated from high school in 2009, 2010, or 2011.

**College Matriculation Rate:** The percentage of high school graduates who attend a two- or four-year college within 16 months of high school graduation.

**College Persistence Rate:** The percentage of students attending college who persist through their second year of college (e.g., through winter/spring term of their second year).

## Benchmarking for Success

There are **three crucial junctures** for students to navigate as they move through high school and college—successfully graduating from high school, applying to and attending college, and then persisting through their second year of college. Shining a light on these three steps and figuring

out strategies to help students successfully transition into and through college is critical if Massachusetts is to close achievement gaps so that the “new normal” is one in which all students are prepared to succeed in college. Mass Insight sets annual College Success goals and benchmarks for AP exam taking, college attendance, college persistence, and

college graduation, for each high school involved in the program and for the overall College Success/STEM program. Meeting and exceeding these goals will dramatically improve lifelong learning and economic prosperity among Massachusetts' students, families, and communities.

<h3>The College Success Benchmarks</h3>	Why it is important to focus on high school graduation, college matriculation, and persistence.	College Success Goals and Benchmarks for all students, focusing on low-income, African-American, and Hispanic students.	The College Success/STEM program's impact on graduation, college attendance, and persistence.
	<b>First, students must graduate from high school</b> in order to apply to college. High school graduation rates for underserved populations are rising, but remain below national rates.	<b>Goal:</b> Mass Insight schools will experience <i>slight increases in high school graduation</i> due to improved instruction and a shift in expectations among teachers and students.  <b>College Success Benchmark:</b> 90 percent of incoming freshman will graduate from high school in five years.	<b>High school graduation rates</b> for low-income students in Mass Insight schools increased by more than 4 percent, outpacing gains made in non-Mass Insight comparison schools and among all low-income students in Massachusetts.
	<b>Second, high school graduates must apply to and matriculate to college.</b> Like high school graduation, college attendance rates have improved, but still have much room to grow.	<b>Goal:</b> Mass Insight students will <i>attend college at higher rates</i> than similarly situated students in non-Mass Insight schools and equal or surpass state averages and exemplar benchmarks set by high-performing districts.  <b>College Success Benchmark:</b> 80 percent of high school graduates will enroll in a two- or four-year college within 16 months of graduating from high school.	<b>College attendance rates</b> for Mass Insight students have increased to <i>84.4 percent for all students</i> , surpassing our benchmark. College attendance rates for low-income students (80.2%) and African-American students (82.4%) met our benchmarks and surpassed the state average. The college attendance rate for Mass Insight's Hispanic students stands at 74.2 percent, below our benchmark but still 12 percentage points higher than the state average.
	<b>Third, students must persist in college, which entails that students have the right mix of academic skills, college acumen, and support to make it into and through their second year.</b> National data shows that college persistence—moving into years two and three of college—is a key indicator of whether low-income, African-American and Hispanic students will successfully graduate from college.	<b>Goal:</b> Mass Insight students will <i>persist in college at higher rates</i> than similarly situated students in non-MIE schools and equal or surpass state averages and exemplar benchmarks set by high-performing districts.  <b>College Success Benchmark:</b> 85 percent of students attending college will persist into their second year of college.	<b>College persistence rates</b> for Mass Insight students <i>have remained consistently high, standing at 86.3 percent for all students and at 85.3 percent for low-income students</i> , which meet college success benchmarks. The persistence rates for African-American and Hispanic students are just under 85 percent (at 84.4% and 84.6%), yet significantly higher than the state average.



## What is the impact of the College Success/STEM program on college matriculation and persistence?

**Mass Insight students exhibit consistently high rates of college attendance and persistence.** Overall, college attendance and persistence rates have remained consistently high, with 84.4 percent of Mass Insight students matriculating to college and 86.3 percent persisting in college.

**Students from low-income families are significantly more likely to attend and persist in college if they complete a math, science, or English AP course.** More than 80 percent of low-income Mass Insight students attended college and 85 percent of students attending college are persisting in college.

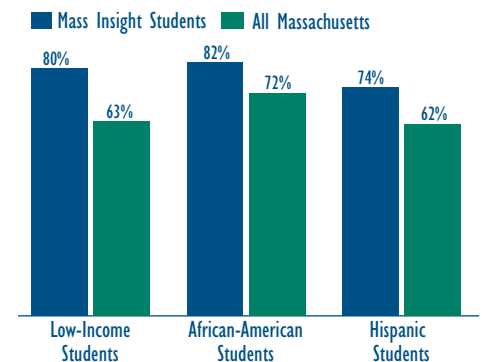
Charts 1 and 2 display college attendance rates and college persistence rates for students in Mass Insight schools taking one or more AP math, science, or English courses and all students in Massachusetts, by income and ethnicity.

### College matriculation and persistence: Low-income students.

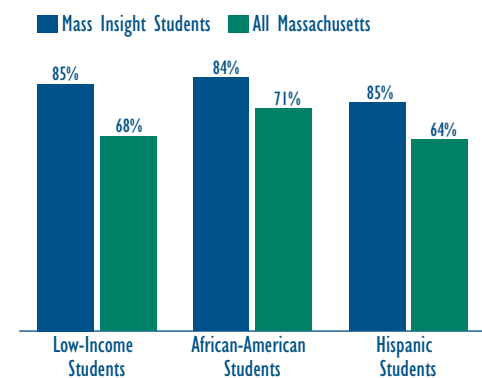
The college attendance rate for low-income Mass Insight students is somewhat lower (80.2%) than non-low-income students, but is still significantly higher than state and national rates for low-income students. The persistence rate among low-income students (85.3%) is similar to the persistence rate for non-low income students.

**College matriculation and persistence: African-American and Hispanic students.** While African-American Mass Insight students attend and persist in college at slightly lower rates than white students, their attendance and persistence remain significantly higher than rates among non-Mass Insight African-American students (statewide and nationally). The college attendance rate among Hispanic students (74.2%) is lower than college attendance rates among whites, African-Americans, and Asians, although the Hispanic persistence rate is on par with other groups.

**Chart 1. College Matriculation: Percent of Mass Insight students attending college**



**Chart 2. College Persistence: Percent of Mass Insight students attending and persisting through year 2 of college**



**Table 1. College Matriculation and Persistence**

Data for students in Mass Insight schools taking one or more AP Math, Science, or English courses						All Massachusetts data for 2011 high school graduates		Mass Insight Education's Internal College Success Goals	
2009 to 2011	# of Mass Insight graduates from HS	# attending college	# persisting in college	College Attendance Rate	College Persistence Rate	MA College Attendance Rate	MA College Persistence Rate	Benchmark Attendance Rate	Benchmark Persistence Rate
All students	4997	4217	3639	84.4%	86.3%	75%	81%	80%	85%
Low-income	1994	1600	1365	80.2%	85.3%	63%	68%	75%	85%
Not low-income	3003	2617	2274	87.1%	86.9%	N/A	N/A	85%	90%
Female	2914	2485	2179	85.3%	87.7%	N/A	N/A	80%	85%
Male	2083	1732	1460	83.1%	84.3%	N/A	N/A	80%	85%
White	2822	2476	2143	87.7%	86.6%	77%	83%	80%	85%
African-American	663	546	461	82.4%	84.4%	72%	71%	80%	85%
Asian	586	494	445	84.3%	90.1%	82%	88%	80%	85%
Hispanic	656	487	412	74.2%	84.6%	62%	64%	80%	85%

## How does students' performance on AP exams affect their choice of college and subsequent matriculation to and persistence in college?

### Data supports three key hypotheses proposed in our 2013 Achieving College Success Report:

1. Taking a math, science, or English AP course increases a college-going student's likelihood of attending a four-year college instead of a two-year college.
2. Taking an AP course significantly increases the likelihood that a student will persist in a four-year college, irrespective of the AP score attained by the student.
3. Scoring a 3 or better on a math, science, or English AP exam dramatically increases the likelihood that a student attending a two-year college will persist into year two of college.

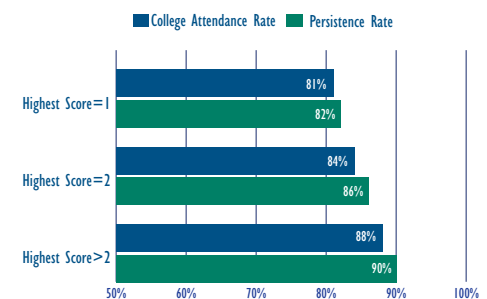
Charts 3 and 4 display the relationship between AP scores and subsequent college attendance and persistence rates and the relationship between students' AP scores, attendance at a two- or four-year college, and persistence in college.

**College attendance and persistence rates among students scoring a 2 or better on at least one AP exam are consistently high.** College attendance rates for students scoring a 2 or higher range from 84.2 percent to 87.8 percent

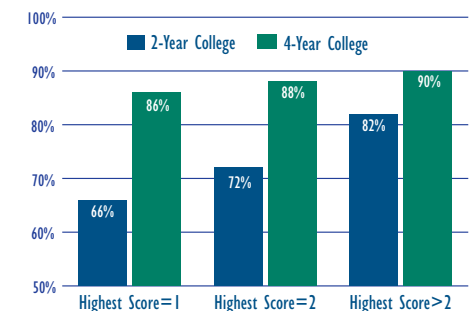
and college persistence rates range from 85.6 percent to 89.6 percent. College attendance and persistence rates for Mass Insight students with a high score of 1 (the lowest possible score) on all AP exams are somewhat lower (81.3% and 81.8%, respectively), but still at or above state averages.

**Taking at least one AP exam leads to significantly higher rates of students attending four-year colleges.** Eighty-six percent (3,622 of 4,217) of Mass Insight students attending college are

**Chart 3. College attendance and persistence rates among Mass Insight college-going students, by highest AP score attained in high school**



**Chart 4. College persistence rates among Mass Insight students attending 2- or 4-year colleges, by highest AP score attained in high school**



attending four-year colleges rather than two-year colleges, which is greater than was anticipated and significantly higher than the statewide rate of 71 percent (DART SAHS, 2011 graduating class). There is a strong relationship between AP course-taking and students' decisions to attend a four-year college, regardless of the highest AP score attained by the student.

**For students attending two-year colleges, scoring a 3 or better on an AP exam is positively correlated with higher persistence rates.** Yet, as displayed in Chart 4, students that score a 1 or 2 on an AP exam and attend a two-year college are less likely to persist than their counterparts attending a four-year college. A better understanding of why students attending two-year colleges are having difficulty persisting in college is needed so that these students can be identified and appropriately supported.

**Table 2. Matriculation and persistence by highest AP score and attendance at a two- or four-year college.**

	# of Mass Insight HS Graduates	# Attending College	# Persisting in College	College Attendance Rate	College Persistence Rate
Did Not Take Exam	156	98	74	62.8%	75.5%
Highest Score=1	1347	1095	896	81.3%	81.8%
Highest Score=2	1212	1021	874	84.2%	85.6%
Highest Score>2	2282	2003	1795	87.8%	89.6%
2-Year College		595	424		71.3%
Highest Score=1		237	156		65.8%
Highest Score=2		174	125		71.8%
Highest Score>2		147	121		82.3%
4-Year College		3622	3215		88.8%
Highest Score=1		858	740		86.3%
Highest Score=2		847	749		88.4%
Highest Score>2		1856	1674		90.2%

What is the impact of the College Success/STEM program on college matriculation and persistence for students in high-need, urban schools?

The College Success/STEM program is intentionally designed to increase students' access to advanced coursework and high-quality teachers through increased access to AP courses and intensive training and support for AP teachers. Mass Insight schools are strongly encouraged to dramatically increase AP enrollment, especially among low-income and minority students. Documenting how the program actively contributes to increased college matriculation and persistence among students in high-need urban districts will demonstrate that dramatic improvement in urban high schools—those schools that have historically been most resistant to change—is possible, and can be accomplished at scale. If the College Success/STEM program leads to increased matriculation and persistence in high-need schools, there is a compelling argument that it should be a key strategy to be employed by most, if not all, high schools and communities across Massachusetts.

School Type Designation

- **High-Need School:** Percent low-income students 65 percent or higher or designated as a Level 4 or Level 3 school under Massachusetts' state accountability system.
- **Mid-Need School:** Percent low-income students between 35 and 65 percent and designated as a Level 2 school.
- **Low-Need School:** Percent low-income less than 35 percent and designated as a Level 1 or Level 2 school.

Table 3. Matriculation and persistence rates for Mass Insight students by need-based

Data for students in Mass Insight schools taking one or more AP, AP math, science, or English courses						Data for all Massachusetts 2011 high school graduates	
2009 to 2011	# Mass Insight HS Graduates	# Attending College	# Persisting in College	College Attendance Rate	College Persistence Rate	MA College Attendance Rate	MA College Persistence Rate
All students	4997	4217	3639	84.4%	86.3%	75%	81%
High-Need	1531	1247	1068	81.5%	85.6%		
Mid-Need	2304	1926	1634	83.6%	84.8%		
Low-Need	1162	1044	937	89.8%	89.8%		
Students not likely to take AP	468	391	340	83.5%	87%		

Does the College Success/STEM program contribute to increased matriculation and persistence in high-need schools?

Comparing high-, mid-, and low-need schools, it is clear that college attendance rates are somewhat lower among Mass Insight students attending high-need schools compared to Mass Insight students attending mid- and low-need schools. However, it is important to note that the college attendance and persistence rates in high-need schools are significantly higher than the rates for all Massachusetts schools. While the data for all Massachusetts schools includes all students (those taking AP courses and those not taking AP courses) and is not a true comparison, the college attendance and persistence rates among Mass Insight students demonstrates what is possible if schools, teachers, and students are provided with appropriate support, training, and incentives.

College persistence rates are similar among Mass Insight students across school types, providing evidence that students in all schools and from various backgrounds have the capacity to take AP courses and subsequently attend and persist in college.

Does the College Success/STEM program contribute to increased matriculation and persistence among students who would not have taken AP courses in another, non-Mass Insight school?

Low-income students in Mass Insight schools are much more likely to take AP courses than low-income students in non-Mass Insight schools, at a rate of 3-to-1 (Lane & Souvanna, 2012). Specifically, many low-income students in Mass Insight schools would not have taken AP if they had attended a non-Mass Insight school. If taking an AP course were to have little to no impact on how low-income students perform in college, we would expect that the persistence rate of low-income students *not likely to take AP courses*<sup>1</sup> would mirror, or potentially be lower than, national and state persistence rates for low-income students.

For Mass Insight students identified as not likely to take AP: 468 graduated; 391 (83.5%) attended college; of the 391 that attended college, 340 persisted from year one to year two, for a persistence rate of 87 percent.

<sup>1</sup>Many schools use a student's PSAT score as to assess whether or not a student will be successful in AP and to subsequently recommend students for AP courses. Using students' PSAT scores, we identified students scoring a composite score of 130 or less as students that would not be recommended to take AP.

Summary

In our 2013 **Achieving College Success** report, we made the following observation, based on data from the 2009 and 2010 graduating classes of Mass Insight students taking one or more AP math, science, or English courses:

All indicators point to the College Success/STEM program as having a *multiplied positive impact* on students' persistence and success in college, especially among low-income, African-American, and Hispanic students. Low-income Mass Insight students are more likely to graduate from high school, attend college (and in particular, four-year colleges), and persist through their first year of college. As such, the program has the potential to dramatically improve students' chances of making it through the pathway to college success.

Our analysis of students from the first three cohorts of College Success/STEM program schools (2009, 2010, and 2011) confirms our initial observation that Mass Insight students—those taking at least one AP math, science, or English course in high school—are attending and persisting in college at rates that are comparable to the rates seen in suburban and wealthy communities and high schools. Further, our tracking of 468 low-income students who would almost certainly have been screened out of an AP course in the past, based on low 10th grade standardized test scores, and the documentation of their success in college demonstrates that there is significant untapped capacity among students throughout Massachusetts—potential that has not been realized due to outdated beliefs, low expectations for students, and structures that reinforce historical inequities. Mass Insight's College Success/STEM program tackles these antiquated belief systems head on and challenges the status quo, by expecting that all students be able to attend and succeed

in college.

To illustrate the potential of the College Success/STEM program to support efforts to dramatically improve college readiness and success for all students, we pose the following scenario illustrating what is possible if schools in Massachusetts were to meet our College Success Benchmarks.

Our data demonstrates that when low-income, African-American, and Hispanic

students are given access to high-quality teachers, supports, and the opportunity to take advanced courses (e.g., AP courses), they are able to attend and succeed in college.

The proposed College Success Benchmarks—90 percent high school graduation, 80 percent college attendance, and 85 percent college persistence—are attainable.

We ask:  
What if these benchmarks were met by all of the high schools in Massachusetts?

Table 4. Massachusetts' data for high school graduation, college matriculation, and persistence for the students in the 2011 graduation

	# of Students in 2011 Cohort	Graduate High School Within 5 years	Enroll in College	Persistently Enrolled in College	Cumulative Percentage of Students in Cohort Persisting in College
Current statewide data for low-income students	29,406	22,033 75%	11,905 54%	8,753 74%	30% of 9th graders persist in college
If 90, 80, 85 Benchmarks were met...then	29,406	26,465 90%	21,172 80%	17,996 85%	61% of 9th graders may have persisted in college

Source: 9th grade cohort of students, DART SAHS

Expecting that just over 60 percent (61%, to be exact) of 9th grade students will persist through year two of college is an ambitious yet attainable goal. Many suburban communities already surpass this goal for non-low-income students. And while some may argue that 61 percent is too low of a benchmark, attaining this benchmark would make a tangible and immediate difference for thousands of young adults and could potentially alter the economic and social landscape across Massachusetts, especially in our urban communities.

If the benchmarks for high school graduation, college matriculation, and persistence had been attained for the 2011 cohort of students, an additional 9,243 individual students would be persisting through their second year of college.

If Massachusetts and its communities are to truly "strengthen our public education system so that every students is prepared to succeed in postsecondary education", we must reflect upon the following questions, answer these questions in the affirmative, and actively employ strategies that make this a reality.

- Do we believe that all students that attend high school are capable of participating in and working to succeed in AP?
- Should students leave high school prepared to succeed in college or in a career, most of which require advanced skills?
- When students attend college, do we believe that they should, at the very least, be able to successfully complete two years of college, if not four years?



## Appendix A: Theory of Action guiding the College Success/STEM program

The College Success/STEM program endeavors to directly address the core challenges—closing the achievement gap and improving college readiness and success in STEM—through a systems-based approach that uses multiple levers to drive improvement.

**On a programmatic level,** the College Success/STEM program is a research-based initiative with defined program elements that incorporate multiple levers for changing teacher and student behaviors and that is linked with specific measurable goals and targets to gauge progress.

Interested schools submit a competitive proposal to participate. Once accepted, participating schools enter into a **performance partnership** with Mass

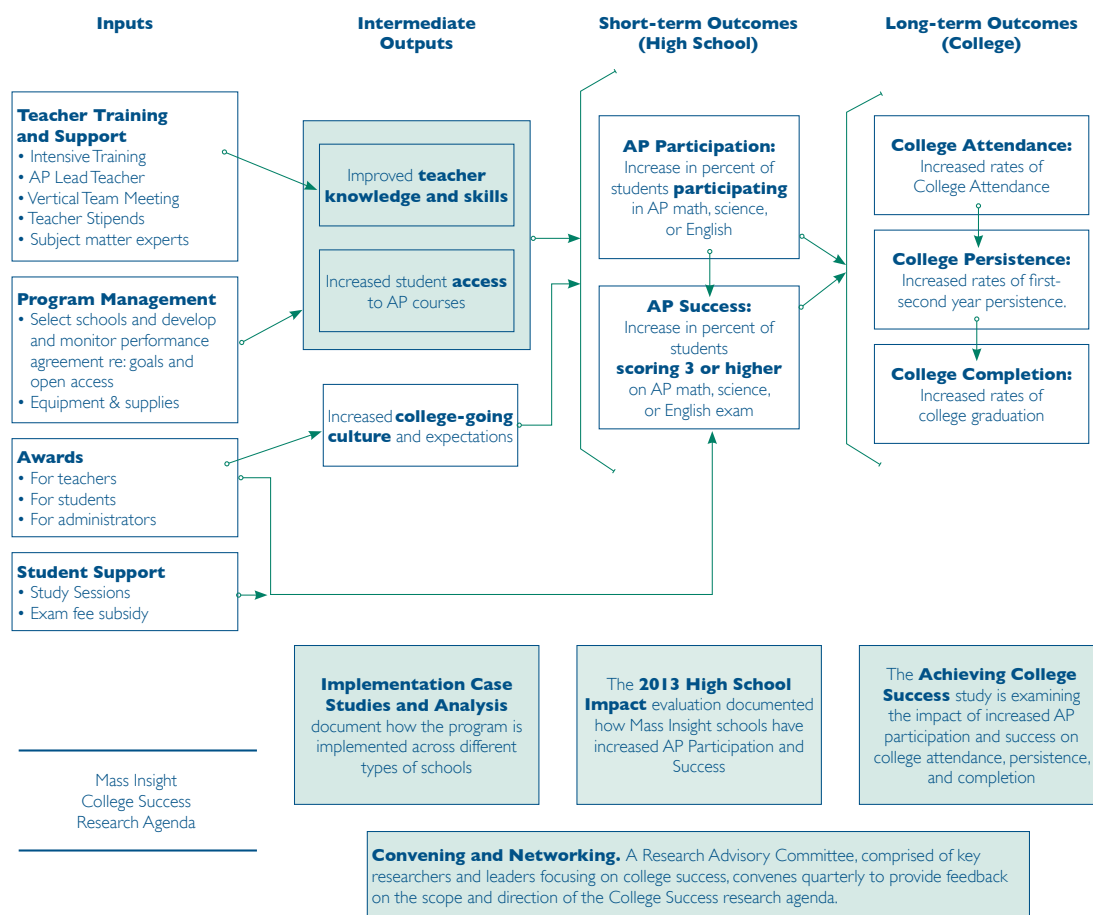
Insight that articulates expectations for the partnership and sets goals for program participation. Teachers receive seven to nine days of teacher training and students participate in up to 18 additional hours of study sessions during the school year. Teacher and student incentives, as awards for participation and success on AP exams, supplement the teacher and student support and serve as an additional lever for change.

**At a strategic level,** Mass Insight employs strategies designed to ensure the scalability and sustainability of the program within and across multiple schools. In doing so, Mass Insight has intentionally integrated strategies that characterize successful reform efforts, including Massachusetts' own effort to raise academic standards.

Display 1 depicts the core program components (inputs) and the expected outputs and short- and long-term outcomes of the program.

A significant infusion of national investment, more than \$16 million through 2013, will have been used to jumpstart Mass Insight's College Success/STEM program effort in Massachusetts. To capitalize on its investment and initial success in over 70 schools, Mass Insight is currently in the process of transitioning to in-state public/private financing. Mass Insight's initial infusion of funding, combined with its intensive and ongoing focus on goals and measuring progress, has positioned Mass Insight to successfully expand to new schools and to sustain efforts in schools demonstrating success.

**Display 1. Conceptual Framework and Logic Model for the College Success/STEM Program**



## Appendix B: Methodology for developing comparison groups

The District Analysis and Review Tool (DART) developed by the Massachusetts Department of Elementary and Secondary Education was used to identify the comparison schools used in the analysis. Extensive information on the DART, including the statistical method used by DART to identify “comparable” districts and schools, is located at: <http://www.doe.mass.edu/apa/dart/>.

While the DART is designed to identify comparable districts and schools for a single district (or school), the tool is not specifically designed to identify a set of comparison schools for a group of schools. However, the DART provides an excellent starting point for identifying a potential pool of comparison schools. The following is the process used by INSTLL to use the DART to develop a meaningful set of comparison schools.

1. We grouped the Mass Insight schools into three groups, based on percentage of low-income students and each school's accountability status, and based on discussions with Mass Insight program staff. As described in the body of the report, we used the following criteria:

- **High-Need School:** Percent low-income students 65 percent or higher or designated as a Level 4 or Level 3 school under Massachusetts' state accountability system.
- **Mid-Need School:** Percent low-income students between 35 and 65 percent and designated as a Level 2 school.
- **Low-Need School:** Percent low-income less than 35 percent and designated as a Level 1 or Level 2 school.

2. Using DART, we identified the nine comparison schools for each school in Group

A (and then Group B and Group C) and listed these schools in a spreadsheet, for the purposes of analysis and sorting. Through this process, we identified a pool of potential comparisons for each group. For instance, the pool of potential comparison schools for Group A included 24 schools.

3. Each pool of potential comparison schools was reduced and the final set of comparison schools selected based on the following decision rules: (1) meeting the criteria for the group, as defined in 1, above; (2) being identified (through DART) as a potential comparison school by two or more of the Mass Insight schools in the group.

Following the preliminary selection of comparison schools, we met with program staff to discuss potential issues and needed additions. Based on discussions with program staff, it was mutually decided to add three schools to the non-Mass Insight Group A set of comparison schools in a desire to compare Mass Insight high-need/low-income schools to higher performing high schools with similar populations of low-income students. Specifically, Brockton High School, Lynn Classical High School, and Lynn English High were added to the Group A comparison schools, even though they are currently designed as Level 2 schools in the state's accountability system.

## Appendix C: Data

All student records are stored in a password-protected Filemaker Pro database. Individual, student-level data provided by the College Board, obtained via data-sharing agreements with each participating high school, represents the full sample of Mass Insight students and includes 13,431 individual student records for students who enrolled in at least one Mass Insight-sponsored AP course between 2009 and 2012. Information on students' attendance and success in college was accessed through a data-sharing agreement with the National Student Clearinghouse (NSC). The latest data request

from NSC was made in July 2013 and included records for students enrolling in college in fall 2009, 2010, and 2011. Whether a student is “persisting” in college was determined according to the following criteria:

- 2009 graduates attending college after January 1, 2011
- 2010 graduates attending college after January 1, 2012
- 2011 graduates attending college after January 1, 2013

The full data set links student AP course-taking and performance with college attendance and persistence, as provided by NCS data categories. The data set includes variables distinguishing whether students took one of 13 discrete AP courses, the score students received on each AP exam, and students' PSAT scores. Summary variables were computed as follows:

- **Highest AP score achieved:** The highest AP score attained by a student across all AP exams taken.
- **Total number of AP courses taken:** The sum total of AP courses taken by a student.
- **Measure of College Readiness:** Students scoring 130 or lower on the PSAT combined = not likely to take AP.